
Lead Scientist's Report

Summary: This report includes seven items: (1) Summary of one article from *San Francisco and Estuary Watershed Science* on subsidence issues in the Delta; (2) Summary of three brown bag seminars about ecosystem services; (3) Delta Science Plan review and update; (4) Ballast Water Feasibility Study and Independent Review Panel Report; (5) Announcement of the 10th Biennial Bay-Delta Science Conference (6) Announcement of the 2018 class of Delta Science Fellows; (7) By the Numbers Report.

Summary of research article: Simulation of Subsidence Mitigation Effects on Island Drain Flow, Seepage, and Organic Carbon Loads on Subsided Islands Sacramento–San Joaquin Delta. Deverel, Steven J.; Leighton, David A.; Lucerno, Christina; et al. *San Francisco Estuary and Watershed Science*. December 2017

Subsidence (gradual sinking of land) has led to significant loss of elevation in the Sacramento-San Joaquin Delta and contributes to levee instability and water quality problems. Because Delta islands are at a lower elevation than surrounding channels, water seeps through and underneath levees into the adjacent islands, and this seeping water weakens levees. Seepage rates across the levees are affected by the relative elevation of the islands, as well as water levels and land use within the islands. A related concern is the water quality of drain water that accumulates on subsided islands, as this drain water is often discharged into adjacent channels. Dissolved organic carbon is a particular water quality concern on the subsided islands. Dr. Deverel and his colleagues developed a set of models that simulate groundwater flow and transport of dissolved materials in the groundwater under various management scenarios.

The researchers used data from monitoring wells on Twitchell Island, as well as local soil characteristics to calibrate the models of groundwater flow and transport dynamics. Different model runs compared groundwater conditions and transport under current land use (corn, alfalfa, and pasture) with seven alternate land uses that combined wetlands and rice fields along with different water management practices. The results of the model identified that the alternative land uses (i.e., rice and wetlands) reduce seepage of water onto the island and improve levee stability. However, these alternative land uses also result in increased amounts of dissolved organic carbon in drain waters; discharge of drain water into adjacent channels would have water quality implications. The researchers identify that these water quality issues can be managed through hydrologic controls that minimize the export of drainage water into channels. While the model results are specific to Twitchell Island, the findings are applicable to other subsided islands in the Delta.

Brown Bag Seminars: Ecosystem Services in the Delta, a three-part series

Ecosystem services are the benefits that humans receive from functioning ecosystems, and the evaluation of these services is a valuable way to quantify the benefits that nature provides, such as water purification, storm protection, climate regulation and carbon sequestration, recreation, and scenic beauty. In January 2018, the Delta Science Program (DSP) hosted a three-part seminar series that explored how ecosystem services can be used in land-use planning, management decisions, and scientific research in the Delta. The three invited speakers were Iryna Dronova, an Assistant Professor at University of California, Berkeley (UC Berkeley); Van

Butsic, an Extension Specialist and Adjunct Professor at UC Berkeley; and Ben Bryant, a Postdoctoral Scholar for Stanford University's Natural Capital Project and Water in the West.

Dr. Dronova, a former Delta Science Fellow, discussed the extent to which locations provide a mix of ecological, societal, and economic benefits and serve as multi-functional "working" landscapes. She identified the importance of environmental heterogeneity (variations in local conditions in both space and time) as a common factor affecting ecosystem services. Heterogeneous landscapes are typically more aesthetically pleasing, provide greater ecological benefits, and increase ecological resilience or recovery following disturbances. Dr. Dronova showed how aspects of the Delta Plan's vision for the future, including increasing biodiversity and hydrological variability, resonate with the notion of environmental heterogeneity. However, more data are needed to better understand the distribution of current ecosystem services in the Delta.

Dr. Butsic highlighted the use of a software tool called InVEST that was developed by Stanford University's Natural Capital project. With InVEST, users can estimate differences in ecosystem services across different land types and land uses, from natural areas to rangeland and agricultural areas. This analysis can identify tradeoffs when considering different land uses for a particular land parcel or when weighing benefits of different sites for targeted management or conservation efforts. Dr. Butsic explored these tradeoffs through a case study documenting land use decisions for a parcel in Napa County that was evaluated for conservation by UC Berkeley and the Coastal Conservancy.

Dr. Bryant discussed land use decision-making in the Central Valley and used recently developed software models to evaluate changes in ecosystem services on a landscape scale. This approach is currently being applied in the Central Valley towards objectives such as providing clean drinking water, maintaining agricultural livelihoods, and ensuring adequate water quality and instream flows for aquatic species. The modeling approach that Dr. Bryant discussed can be used to evaluate a mix of different land uses and objectives in order to optimize ecosystem services across the landscape. The models generate maps that identify where particular land uses would best prioritize the desired objectives.

Delta Science Plan Review and Update

The DSP is leading the 5-year review and update of the Delta Science Plan. The Delta Science Plan, originally completed in November 2013, fulfills a recommendation in the Delta Plan (GR 1) to address the need for collaborative approaches to develop and communicate scientific knowledge that informs policy, management, and the public. The Delta Science Plan is intended to be a guidance document that is shared across the Delta science community, and it includes mechanisms to promote open and transparent science that supports the many programs addressing Delta issues. The goals of this first comprehensive review and update are to incorporate new concepts that reflect the current science, management, and policy landscape of the Delta; reflect on what has been accomplished; and identify how science in the Delta has advanced since the document's release in 2013.

This update will involve input from the broad Delta science community. Since January 2018, the DSP has been conducting early outreach efforts to receive initial input from collaborative science groups (e.g., Interagency Ecological Program, Collaborative Adaptive Management Team, and others). Input to date has identified the need for more discussion on science-policy governance (how the various science and policy activities and groups in the Delta are

integrated) and the suggestion of a “horizon scanning effort” to identify emerging trends and potential issues that the Delta may face in the future. At the March 13, 2018 Science Advisory Committee (SAC) meeting, the SAC will provide input on the current draft of the Delta Science Plan. In addition, the DSP will facilitate a public workshop on April 6, 2018 to receive more detailed input on the contents of the Delta Science Plan, including recommendations to improve document clarity and how the Delta science community can be engaged in jointly implementing the Delta Science Plan.

Feasibility Study of Shore-Based Ballast Water Reception and Treatment in California

Local sea or estuarine water is commonly used as ballast (water taken into ships) to stabilize, balance, and trim ships; however, ballast water can serve as a conduit for the introduction of non-native species and harmful pathogens when it is released at the ship’s destination. Multiple efforts have been made to reduce ballast water introductions, and California’s Interim Ballasts Water Discharge Performance Standards are more stringent than the federal and international standards. A feasibility study was developed for the potential use of shore-based ballast water reception and treatment facilities. This task was undertaken as an interagency request from the State Lands Commission to the Council and utilized an independent review panel of five national experts to review the feasibility study. The review took place in three phases starting in September of 2015, with the final meeting of the review panel in October 2017. The review panel provided recommendations on a range of issues to improve the report throughout its development, including the consideration of implementation issues. The final draft report, titled *Feasibility Study of Shore-Based Ballast Water Reception and Treatment in California*, was recently completed and transmitted to State Lands Commission, along with the panel review recommendations. The feasibility study recommends the use of a shore-based network of treatment barges as a means of transferring ballast water from ships for treatment in order to meet the state’s interim standards. Implementation of shore-based ballast water treatment and barge network will require further consideration and planning, including evaluation of a demonstration project using this approach.

Announcement of 10th Biennial Bay-Delta Science Conference

The 10th Bay-Delta Science Conference will be held at the Sacramento Convention Center September 10-12, 2018. The Conference is a forum for the Delta science and management community to present recent findings to a broad audience. This year’s conference theme is “Our Estuary at an Intersection”. The management of the Bay-Delta ecosystem sits at the crossroads of ecology, economy, culture, and resource management. Navigating the intersection has direct implications for statewide water supply and efforts to improve the aquatic ecosystem for fisheries, recreation, tourism, and ecosystem services.

The three-day conference will kick off on Monday, September 10, 2018 with a plenary session that will cover topics including adaptive management, social science, and science communication. The remaining conference program will feature both oral and poster presentations, organized across a broad range of scientific and management topics. As in previous years, there will be an early career-mentor lunch, an art program, the announcement of the 2018 Brown-Nichols Science Award winner, and student awards for the best oral and poster presentations. Abstracts to present at the conference and proposals for special sessions or poster clusters are due April 23, 2018. Nominations for the Brown-Nichols Science award are

due June 29, 2018. For more information, and to submit abstracts or nominations, visit the conference website: <http://scienceconf2018.deltacouncil.ca.gov/>

2018 Class of Delta Science Fellows

The DSP recently awarded 2018 Delta Science Fellowships (Attachment 1) to nine doctoral students and postdoctoral researchers. This is the eleventh class of Delta Science Fellows, with the program dating back to 2003. The DSP and the Council partnered with the State and Federal Contractors Water Agency and California Sea Grant to award this year's fellowships. Fellowships were awarded based on the intellectual merit of the application and the expected contribution of the proposed research to the high impact science actions identified in the Science Action Agenda.

This Delta Science Fellowship Program pairs early-career researchers with local agency scientists and senior research mentors to perform research relevant to management issues in the Delta system. The program is unique in engaging students and post-docs to work directly on management issues and in requiring mentorship from agency/management staff as well as academia. Two key goals of the program are to advance the understanding of the complex environments and systems within the Delta through the proposed research and to train the next generation of research scientists who will work on the complex science and management problems in the Delta.

By the Numbers

Delta Science Program staff will give a summary of current numbers related to Delta water and environmental management. The summary (Attachment 2) will inform the Council of recent counts, measurements, and monitoring figures driving water and environmental management issues.

List of Attachments

Attachment 1: 2018 class of Delta Science Fellows

Attachment 2: By the Numbers Summary (report to be provided at the Council Meeting)

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